

REMARKS

In response to the above Office Action, claim 1 has been amended to make it clear that an alumoxane is formed in-situ by contacting the support material containing 1-10% water with a trialkylaluminum compound. Support for this can be found, for example, on page 2, lines 16-20 of the specification. It is not believed this raises a new issue after final rejection because this is what inherently happened when the hydrated support was combined with a trialkylaluminum compound. In addition, claim 8 has been amended for clarity and to be consistent with claim 1.

In the Office Action, the Examiner continued to reject claims 1-11 under 35 U.S.C. §103(a) for being obvious over Kimberley in view of Chang.

As noted in the last Reply, Kimberly discloses catalysts of the type covered by the claims. It also discloses its use in combination with a support and an alkylalumoxane as an activator. However, as further pointed out, there is no teaching in Kimberley that the activator can be formed in-situ in the support by combining a support material containing 1-10% water with a trialkylaluminum compound as set forth in claim 1. Rather, the alumoxane is prepared first and then combined with the support and transition metal complex to activate it. The Examiner appears to acknowledge this difference on page 3, lines 12-13 of the Office Action where he notes that "Kimberley teaches adding alumoxane to support and then adding catalyst to the support and activating the catalyst." (Emphasis added).

However, it appears the Examiner is maintaining that since Kimberly additionally adds a trialkylaluminum compound, and the support is not dried prior to adding it, that this would also form an alumoxane in the support. In making this argument, the Examiner refers to "Chang" (page 3, line 14), but it is believed in view of the previous

arguments that the Examiner meant "Kimberley." In other words, that since Kimberley's support is not dried prior to adding the trialkylaluminum compound, an alumoxane forms upon its addition to the support for the transition metal complex.

However, it is not understood why the Examiner believes the support of Kimberley necessarily contains water or that it is "not dried prior to adding trialkylaluminum" and has not pointed to any teaching in Kimberley to support his position. In fact, Kimberley teaches just the opposite. Note, for example, in Example 26 on page 23, line 11 that the silica support was "heated under flowing nitrogen at 700°C" before anything was added to it. See also Example 27 on page 23, lines 22-23; Example 32 on page 26, lines 1-2; or Example 33 on page 27, line 14.

In all cases the silica support material was dehydrated before use so that it could not contain any water. Consequently, no alumoxane would be formed upon adding the trialkylaluminum compound as speculated by the Examiner.

This is because as is well known in the art of preparing catalysts based on transition metal compounds and alkyl aluminum compounds, the preparation is conventionally carried out (i.e., as exemplified by Kimberley, which belongs to the same assignee as the present invention), under conditions that rigorously exclude water. Aside from the fact that the direct mixing of water and an aluminum alkyl is very dangerous (explosion hazard), it is wasteful to destroy the alkyl activator with water. Hence, all support materials and complexes are rigorously dried before any alkyl aluminum is added. This is true both for the use of the trialkyl aluminum and alumoxane activators. Thus the technology of Kimberley is carried out under rigorously anhydrous conditions. Any support materials employed with the Kimberley catalyst system would

be carefully dehydrated as noted before use to avoid wastage of valuable alumoxane or other activator.

Thus it is submitted, there is nothing in Kimberly which suggests forming alumoxane by contacting a support material containing water with a trialkyl aluminum compound to form an alumoxane in-situ and then supporting the defined transition metal compound thereon as claimed.

The secondary reference to Chang (EP'716) teaches, as previously acknowledged, the adding of a trialkylaluminum compound to a silica gel containing 6 to 10% water as a catalyst support material to form an alumoxane component of the catalyst system. The Examiner therefore believes, in essence, that it would be obvious to prepare the catalyst of Kimberly by the method taught in Chang.

However, Chang has to do with the activation of a totally different kind of transition metal catalyst, namely metallocenes. These transition metal complexes differ both chemically and in their response to activators from the type of transition metal complexes claimed. Consequently, and because of this, one skilled in the art would not assume that technology employed in making metallocene catalysts would necessarily be usable in a process for making transition metal complex catalysts of the type in Kimberley and as claimed.

In this regard, reference is made to EP 0 367,597, also to Chang, cited in the Information Disclosure Statement filed simultaneously herewith, which is later than Chang (EP'716) cited by the Examiner. Here also a metallocene catalyst is prepared from a silica gel containing 6 to 20% by weight water that has been mixed with a trialkylaluminum solution to form an alumoxane coated silica gel. The catalyst is used

for preparing polyethylene wax having a narrow molecular weight distribution by gas phase polymerization.

Chang (EP'716), while teaching the catalysts are usable in the gas phase polymerization of ethylene, does not teach, other than the amount of polyethylene formed (Table 1, page 9), what the molecular weight is of the polyethylene formed. Thus taking these two Chang references together (EP'716 and EP'597) would lead a man skilled in the art to believe that metallocene catalysts using alumoxane containing supports prepared in this manner were only suitable for making low molecular waxes, not the high molecular weight polyolefins obtainable from the catalysts of the present invention.

In any event, the claimed method for making the alumoxane activator for the types of transition metal complexes claimed is not only safer than conventional methods, but surprisingly provides higher catalyst activity and the ability to make higher molecular weight polymers.

The examples in the specification demonstrate these surprising results. Comparative Examples 5 and 6 show an activator/support prepared by adding preformed methylalumoxane (MAO) to dried silica as a support for the Formula (I) complex to form an active catalyst. Example 7 illustrates the preparation of the catalyst by the treatment of "moist" silica with trimethylaluminum in accordance with the present invention. From the results obtained in polymerizing ethylene (Table on page 19), it can be seen that the activity and productivity values were higher when the support was made according to the present invention than when made conventionally as in Kimberly.

The Examiner's attention is specifically directed to the comparison between Comparative Example 5 and Example 7. In Comparative Example 5 there was slightly

more transition metal catalyst used initially than in Example 7 (0.0000515 mol to 0.00005 mol), though analysis of the final catalyst composition showed they contained the same nominal amount of iron, and slightly more methylalumoxane (0.005 mol to 0.00494 mol). In fact, the nominal amount in the final catalyst composition was 12.7% w/w MAO in Comparative Example 5 and 12.5% w/w MAO in Example 7. Yet both the activity and productivity of the catalyst composition of Example 7 were higher than the composition of Comparative Example 5 as shown in the table on page 19.

The same is true with respect to Comparative Example 6. There the nominal amount of MAO in the final catalyst composition was 12.8% w/w MAO (compared to 12.5% w/w in Example 7), yet both the activity and productivity of the catalyst composition of Example 7 were higher than that of the catalyst composition of Comparative Example 6 as shown in the table on page 19. The results may not be a lot better, but they are better. Moreover, it is important to note that even if the results were the same, there is still an advantage in preparing the catalyst composition according to the present method because it is safer and cheaper (by virtue of using an alkyl aluminum rather than an alumoxane).

In summary, these examples clearly demonstrate that improved results are obtained when the only thing different is the way in which the alumoxane is provided in the support.

While it may have been "obvious to try" the method of Chang (EP'716 or EP'397) in preparing the catalyst of Kimberly, there is nothing in Chang to suggest these improved results when the process is used with transition metal complexes of the type claimed as the catalyst.

The Examiner appears to have ignored this comparative data. However, as noted in M.P.E.P. §716.02(a), the superiority of a property or properties shared with the prior art rebuts a prima facie case of obviousness. The properties in this case are the activity and productivity of the catalyst prepared according to the present invention. These are not mere conclusions. To the contrary, they are supported by direct, comparative data with the closest prior art as required by the noted section of the M.P.E.P., namely Kimberley. Thus the comparative data must be taken into account.

The Examiner suggests that perhaps the results achieved are not necessarily achieved over the breadth of the claimed invention. However, not only has Applicant provided two comparative examples, both of which show inferior results with respect to activity and productivity of the catalyst composition, but the Examiner has not pointed to anything that would suggest any other results.

Accordingly, it is submitted that this evidence is sufficient to overcome any prima facie case of obviousness based on Kimberly in view of Chang (EP'716), and its withdrawal as a ground of rejection of the claims is requested.

It is believed claims 1-11 are in condition for allowance.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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